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A Framework for a Multimodal Analysis of Teaching Centered on Shared Attention and Knowledge Access

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The Activity of Teaching: A Social Learning Strategy

- ▶ Everybody *can try* to learn anything alone, but some content **is better learned socially** (time, energy, opportunities, danger)(Kendal et al., 2018)
- ▶ Teaching, a.k.a. **social learning with explicit instructions**, is a form of social and cultural learning that relies on domain-general abilities

The Abilities Grounding Teaching

- ▶ Heyes (2018) argues that ability of teaching is built on top of **social faculties** like:
 - ▶ Selective social learning
 - ▶ Imitation
 - ▶ Mind reading
 - ▶ Language

In which Occasions does Teaching Occur, Actually?

- ▶ When a **L**earner encounters 2 kinds of difficulties (Kline, 2015), either
 - ▶ to **have access** to the **C**ontent, or
 - ▶ to **focus her attention** to **C**
- ▶ And when a **T**eacher can allocate some time to help **L** (even it's costly)

Some Cues to Trigger Access or Attention

- ▶ **Communicative and attentional** cues are crucial in social learning, to make teaching easier
 - ▶ Visual or vocal priming: e.g., **T** pointing to **C** in presence of **L**
 - ▶ Joint attention to **C** (in some cases, parallel)
 - ▶ Action and speech contingencies
 - ▶ Adapted communication (“teacherese”)

Research Questions

- ▶ Which **framework** for accounting teaching processes?
- ▶ How to capture (part of) teaching processes by **eye-tracking and signal processing tools**?
- ▶ Which **experiments** using this framework to deploy in classrooms?

Components of the Teaching Process

- ▶ **Two steps:** Initial situation (without social help) and teaching situation (with social help)
- ▶ **Determination criteria:** how this teaching situation can be automatically determined?
- ▶ **Five levels of teaching,** of increasing complexity (from Kline, 2015)

Level 1 – Social Tolerance (Teacher as a model)

- ▶ **Initially:** **L** can perceive **C** but its access depends on **T**'s willingness
- ▶ **Teaching:** **T** tolerates that **L** observes her during standard activities, without modifying anything
- ▶ **Criteria:** **L** visually tracks **T** frequently; **T** doesn't track **L** at all

Level 2 – Opportunity Provisioning (a.k.a. Playground Making)

- ▶ **Initially:** **L** would be able to perceive **C**, but its access is difficult
- ▶ **Teaching:** **T** devises specific activities so that **L** can learn (play, chores, etc.)
- ▶ **Criteria:** **C** is modified by **T**; **T** doesn't track **L**; parallel attention towards **C** (is the task completed?)

Level 3 – Teaching by Stimulus or Local Enhancement (actual teaching)

- ▶ **Initially:** **L** can access **C** but lacks attention to it
- ▶ **Teaching:** **T** points towards **C**, slows down her action and speech
- ▶ **Criteria:** Frequent reciprocal gazes between **T** and **L**, “teacherese”, action exaggeration: **T**’s larger body’s bounding volume

Teaching: Higher Levels (not detailed there)

- ▶ Teaching by **evaluative feedback** (**L** accesses **C** but lacks information on her performance) or by **direct explanations** (**L** lacks both attention and access to **C**, and needs explicit information)
- ▶ Involves **mind reading** more intensively, and **language**, so more difficult to be captured by eye tracking tools only

Understanding Classroom Situations

- ▶ Capture teaching levels in a “**smart classroom**” context: cameras, mobile eye-tracker for **T**, camera glasses for **Ls**
- ▶ Use this framework (likely extended to variables like position, noise level) to investigate **notions in educational psychology** (**Ls** time on task, or steering group, **T** immediacy, etc.)(Cortina et al., 2015; Dessus et al., 2016)

Thanks for your attention!

Any questions?

 @pdessus

References @ <https://frama.link/eye-mov>